Illinois River Bridge (Midway Bridge)
Spanning the Illinois River
at Benton County Road 3
Siloam Springs
Benton County
Arkansas

HAER No. AR-28

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, DC 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

ILLINOIS RIVER BRIDGE

(Midway Bridge)

HAER No. AR-28

LOCATION:	Spanning the Illinois River on Benton County Road 3 near Siloam Springs, Benton County, Arkansas. UTM: 15/N4003170/E371060 QUAD: Gallatin, Arkansas
DATE OF CONSTRUCTION:	1922
CONTRACTOR:	Luten Bridge Company, Knoxville, Tennessee.
PRESENT OWNER:	Benton County, Arkansas.
PRESENT USE:	Vehicular bridge.
SIGNIFICANCE:	Completed in 1922, the Illinois River Bridge was designed by Daniel B. Luten, the owner of more than fifty patents on reinforced concrete arch bridges. This intact, 130-foot, two-span concrete bridge in northwest Arkansas is one of state's best examples of an early twentieth century reinforced concrete arch bridge.
HISTORIAN:	Kathryn Steen
DESCRIPTION BY:	Corinne Smith Arkansas Historic Bridge Recording Project, 1988.

ILLINOIS RIVER

The Illinois River starts in northwest Arkansas west of Fayetteville, loops north for a short while and then proceeds to flow southwest, eventually running into the Arkansas River east of Muskogee, Oklahoma. Probably named after the Indian tribe, the river flows through the scenic territory of the Ozarks. In its early stages, the Illinois is crossed by a concrete arch bridge. Over the years, this Illinois River Bridge has acquired the secondary name Midway Bridge due to its location half way along the six miles of gravel road between Highway 16 and Highway 68.(I)

BIDDING

On January 26, 1922, Benton County Judge Joe Beasley took several bids for the proposed Illinois River Bridge. There were offers from three steel bridge manufacturers and the Luten Bridge Company of Knoxville, Tennessee, which specialized in reinforced concrete arch bridges. Though at least one steel bridge firm offered a lower price than Luten's $7,500 bid, the concrete bridge offer was chosen because ". . .the judge thought that in the long run a concrete bridge would be more enduring and require but little upkeep."(2)

The year 1922 was the last year the bridge type could be decided upon by county judges: the Arkansas State Highway and Transportation Department was formed in 1923 and instituted a standardized bridge design.(3)

PLANS

The original plans for the 130-foot bridge are available at the Benton County Courthouse in Bentonville, Arkansas. The final, revised set of plans is dated January 6, 1922, the revision being from a July 25, 1921, set. There are drawings of the elevation, and half section views of the crown, pier and roadway. The name on the plans is Daniel B. Luten.(4) Luten was a well-known engineer of reinforced concrete arch bridges, having more than fifty patents dealing with their construction. There were about 14,000 Luten designed bridges in existence by 1925.(5) A 1907 brochure from the National Bridge Company, a company that Luten headed in the 1920s, expounded

> ". . .[t]he Luten arch combines numerous improvements in arch reinforcement and construction tending to increase the strength, durability and efficiency of the structure. . . .The Luten type of arch, requiring but a single series of reinforcing members, is the simplest and easiest type of reinforced arch to erect that has yet been devised."(6)

The specifications that accompany the plans state that Luten, as designing engineer, was to receive 10 percent of the total cost for the bridge.(7)

CONTRACT

Also in the Benton County Courthouse is the original County Court Record, which includes a transcribed copy of the contract between the Luten Bridge Company and Benton County Judge Joe Beasley and the two other bridge commissioners Lon Williams and J.R. Gamble. The bridge company was committed to providing a reinforced concrete arch ". . .on the Illinois River near the mouth of the Chamber Spring Branch," and to complete the job in no more than 120 days after February 1, 1922. On the other side, the county would pay the company $7,500 in two

payments--one third when the piers and abutment were done and the other $5000 when the entire structure was turned over to the county. In addition, the county would allow the company to take sand and gravel from the site and close off the bridge area to traffic. The contract is signed by the Benton County Bridge Commissioners and the Luten agent, D.H. Daugherty. Along with the contract is the National Surety Company Bond dated January 30, 1922.(8)

On August 2, 1922, the Illinois River Bridge was formally accepted by the Benton County Court. The bridge commissioners were finished with their paid positions and the final $5000 went to the Luten Bridge Company on September 5, 1922.(9)

ENGINEERING DESCRIPTION

The Illinois River Bridge is a two-span, reinforced concrete arch bridge. Each elliptical arch is 65 feet long and contributes to the total bridge length of 145 feet. Concrete is an ideal material for an arch, which is theoretically a compression structure. Concrete is strong in compression, but cannot support tension forces of any great magnitude. In practice, tension is introduced in an arch bridge by the uneven loading produced by a traveling vehicle. To support its tensile forces, the Illinois River Bridge is reinforced with three-quarter inch steel rods. The rods cross the arch near the surface and then bend up through the spandrel walls. This reinforcement geometry is based on the Luten Patent of 1907. As specified for the bridge, the spandrel walls were poured monolithically with the face of the arch rings. The spandrels are filled with gravel to form the 12-foot-wide bridge deck.

The bridge is unadorned except for parapets on either side. The exterior and interior surfaces of the 4-foot-high and 6-inch-thick parapets are decorated with panels formed by indentations in the

wall plane. The posts on the bridge deck directly over the center pier contain plaques with information about the bridge designers and builders.

The downstream side of the center pier is triangular in shape to divert water and debris away from the pier. The other side of the center pier is rectangular. The concrete abutment walls are winged to retain the river banks.

ENDNOTES

1. Kenneth L. Smith, Illinois River (Little Rock, Arkansas: The Ozark Society Foundation, 1977), p. 16.

2. "Concrete Bridge on Illinois," Rogers Democrat Vol. 41, No. 14 (February 9, 1922), p. 6.; Benton County Court Record, Vol. X, February 6, 1922, p. 49.

3. Arkansas Historic Preservation Program, "Individual Data Sheet: Illinois River Bridge," Historic Bridges National Register.

4. Daniel B. Luten, plans for the Illinois River Bridge over Illinois River, Benton County, Arkansas, January 6, 1922.

5. John William Leonard, Who's Who in Engineering, 1925, 2nd ed. (New York City: Who's Who Publications, Inc., 1925), p. 1305.

6. National Bridge Company, Reinforced Concrete Bridges: Luten Patents (Indianapolis, Indiana: National Bridge Company, 1907), pp. 70, 87.

7. Specifications for Concrete Bridge over Illinois River, Benton County, Arkansas, Section 50, "Engineering."

8. Luten Bridge Company contract, Benton County Court Record, Vol. X, February 7, 1922, pp. 50-51.

9. Benton County Court Record, Vol. X, August 2, 1922, p. 97.

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Arkansas Historic Preservation Program. "Individual Data Sheet: Illinois River Bridge." Historic Bridges National Register.

Benton County Court Record. Vol. X, February 6, 1922, p. 49; August 2, 1922, p. 97.

"Concrete Bridge on Illinois." Rogers Democrat. Vol. 41, No. 14 (February 9, 1922), p. 6.

Leonard, John William. Who's Who in Engineering, 1925. 2nd ed. New York City: Who's Who Publications, Inc., 1925), p. 1305.

Luten Bridge Company contract. Benton County Court Record. Vol. X, February 7, 1922, pp. 50-51.

Luten, Daniel B. Plans for the Illinois River Bridge over Illinois River, Benton County, Arkansas. January 6, 1922.

National Bridge Company. Reinforced Concrete Bridges: Luten Patents. Indianapolis, Indiana: National Bridge Company, 1907.

Smith, Kenneth L. Illinois River. Little Rock, Arkansas: The Ozark Society Foundation, 1977.

Specifications for Concrete Bridge over Illinois River, Benton County, Arkansas, Section 50, "Engineering."

LUTEN BRIDGE COMPANY CONTRACT

This AGREEMENT, made this 26th day of January, A.D. 1922, by and between the Luten Bridge Company, of Knoxville, Tennessee, party of the first part and Judge Joe Beasley, Lon Williams and J.R. Gambls, Bridge Commissioners of Benton County, Ark., of Benton County, Stats of Arkansas, party of the second part.

Witnesseth: That the party of the first part hereby contracts and agrees to and with the party of the second part, to furnish material for and to construct One reinforced concrste Arch bridge of the following general dimensions Two spans of 65' each located on the Illinois River nsar the mouth of the Chamber Spring Branch, Benton County, all in accordance with the plans and specifications attached hereto and forming a part of this contract.

Ths said party of the first part hereby agrees to complete the work spscifisd herein within 120 working days from and after February 1st, provided that ths weather or condition of said stream be such as to permit the prosecution of said work within the time specified, or that they are not delayed by causes beyond their control, in which event the time for completion of said bridge shall be extsnded for a period of time equal to such delay.

The said party of the first part hereby further agrses before commencing the work to furnish a bond, in the penal sum of $7,500.00 for the faithful performance of this contraet which bond shall remain in full force and effect for one year from its date as a guarantee that in case of failure of the bridgs, due to faulty design, workmanship, or materials, party of ths first part will repair or rebuild the bridge at their own expense.

In consideration of the foregoing, the party of the second part hereby agrees to pay to the party of the first part the sum of Seven thousand five hundred, ($7,500.00) as follows, one third to be paid when abutments and piers are concreted and the remainder to be paid upon completion and accsptance of the bridgs.

The said party of the second part hereby further agrees to close the site of bridge for traffic and givs to the said party of the first part free use of materials and possession of site of such bridge, and sufficient adjacent grounds, for the purpose of erection; to provide all necsssary stakes and lines for the location of new work immediately upon notification of beginning of same, and to inspect the work or cause it to be inspected immediately upon written notice of its completion.

It is further agreed that the party of the first will be permitted to use local sand and gravel found near the site.

And for the performance of each and every articls of this agreement, the said parties hereby bind themselves by these presents.

In witness whereof, the parties hereto have cause these presents to be executed in duplicate on the day and date first written above.

ATTEST:

LUTEN BRIDGE COMPANY
By D.H. Daughsrty
Party of Second Part, Bridge Committee of
Benton County.
Joe Beasley, County Judge
Lon Williams
J.R. Gamble

Filed Feb. 7, 1922
I.C. Casey, County Clerk

Examined and approved this 7th day of Feb. 1922.
Joe Beasley, County Judge.

NATIONAL SURETY COMPANY BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, LUTEN BRIDGE COMPANY, of Knoxville, Tenneseee, as Principal, and NATIONAL SURETY COMPANY, 115 Broadway, New York, New York, as Surety, are held and firmly bound unto the STATE OF ARKANSAS for use and benefit of Benton County, Arkansas in the penal sum of SEVEN THOUSAND FIVE HUNDRED AND NO/100 ($7,500.00), lawful money of the United States of America, to be paid to said STATE OF ARKANSAS for use and benefit of Benton County, Arkansas, to which payment, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally by these presents.

Signed, sealsd and delivered this 30th day of January, 1922.

The condition of this bond is as follows: That whereas the said LUTEN BRIDGE COMPANY, as Principal, has entered into a contract with Benton County, Arkaneas, by its Bridge Commissioners, Joe Beasley, (County Judge) Lon Williams and J.R. Gamble, for the construction of one (1) one hundred and thirty foot (130') reinforced concrete arch bridge (two (2) spans of sixty-five feet (65') each) complete, located on the Illinois River near the mouth of the Chamber Spring Branch in Benton County, Arkansas, which said bridge is more specifically mentioned in the said Contract, and in the plans and specifications mentioned in the Contract, such work to be performed in accordance with the terms and conditions of said Contract.

NOW, THEREFORE, if the above bounden, LUTEN BRIDGE COMPANY, shall in all things stand to and abide by and well and truly observe, do, keep and perform all and singular the terms, covenants, guarantees and agreements in said contract to be observed, kept, done and performed, and each of them, at the time and in the manner and form therein specified, and shall do and perform all the labor and work and shall furnish all the material as specified in said contract and the plans and specifications therto attached and made a part thereof, and shall indemnify and save harmless said Commissioners of Benton County Bridge Commission, State of Arkansas, againet any loss or damage of whatever kind and character arising or occasioned by deed of negligence of said Principal, his agents, servants, and employees in the prosecution of the work, or by reason of improper safe-guards or incomplete protection to the work, and shall pay all bills for materials and labor entered into the constuction of said work or used in the course of the performance of the work, and shall complete said work within the time specified in said Contract, then this obligation shall be null and void; otherwise to remain in full force and effect.

WITNESS OUR HANDS, this the 30th day of January 1922.

ATTEST:
M.M. Daugherty, Secy (L.S.)

LUTEN BRIDGE COMPANY, Principal
By D.H. Daugherty
G.S. Daugherty, Pres.

ATTEST:
C.E. Clift (L.S.)
Resident Assistant Secretary

NATIONAL SURETY COMPANY, Surety
By Joe F. Clifford, Resident Vice-President

Filed Feb. 7, 1922.
I.C. Casey, County Clerk

Examined and approved this 7th day of Feb. 1922.
Joe Beasley, Co. Judge

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Benton County Court Record, Vol. X

Fsbruary 6, 1922 p. 46

Lon Williams, for services as Bridge Com. in and for Benton Co. on ths Illinois River Bridge Bridge Funds $30.00
John R. Gamble, for services as Bridge Com. in and for Benton Co. on the Illinois River Bridge Bridge Funds $30.00

February 6, 1922 p. 49

In the Mattsr of Letting Contract for Bridge Across Illinois River, Luten Bridge Company, Contractors.

On this day the Court having under advisement the approval of Contract and Bond of Luten Bridge Co. for bridge across Illinois River near mouth of Chamber's Spring Branch, doth find that due notice being given to bidders as required by law, on the 26th day of January, 1922, that at such letting, the Contract wae let to the Luten Bridge Col. of Knoxville, Tenn., for the sum of $7,500.00, said bridge to consist of two concrete Arch Spans of 65 feet each, that said Company has entered into contract as required by law.

It is therefore ordered that the action of the Bridge Commissioners in advertising and letting contract to Luten Bridge Co., be and the same is approved, that the Contract and Bond of said Luten Bridge Company to build said bridge be and the same is approved by the Court and the Clerk is directed to spread said Contract and Bond at length upon the records of this Court.

March 6, 1922 p. ?

--(not direct quote) $8 to Benton Co. Record (newspaper) for publishing notices to Bidders on Bridges

August 2, 1922 p. 97

-IN THE MATTER OF ACCEPTANCE OF
ILLINOIS RIVER BRIDGE.

On this day is presented to the Court the report of the Commissioners' appointed by this Court to make plans and specifications for a bridge across Illinois River near the mouth of Chambers Spring Branch.

The Court finds that the contract for said Bridge was let to the Luten Bridge Co. of Knoxville, Tenn., that the same was to consist of two 65 foot concrete arches, that the same has been constructed according to the plans submitted by said commissioners within the time agreed upon by them, and the same should be accepted by the County and said commissioners discharged from further duties.

It is therefore ordered by the Court that said Bridge be accepted by this Court and that the sum of $7,500.00, the contract price, be appropriated out of the Bridge fund of Benton County to pay for the construction of said bridge, and that Lon Williams and J.R. Gamble as such Commissioners be discharged from further duties.

September 5, 1922 p. 149

—(not direct quote) $5000 to Luten Bridge Company to balance

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SPECIFICATIONS

FOR

CONCRETE BRIDGE

Over Ill Bayou

Benton County Ark.

PLANS AND SPECIFICATIONS

1. The accompanying plans, together with the accepted bid and these specifications form the basis of the contract and are each to be considered part thereof. The contract contemplates a structure complete in all its details. Dimensions given must control in preference to scale measurements. When intermediate dimensions are desired the scales of similar adjacent parts shall control.

ALTERNATE CLAUSES

2. Clauses having no index number are wholly void and of no force. But all numbered clauses shall apply with full force.

LOADING — HIGHWAY

3 (Does not apply unless numbered.) The structure shall support safely a moving load uniformly distributed of 150 pounds per square foot, or a concentrated load of a 20-ton road roller.

HIGHWAY AND TRACTION

(Does not apply unless numbered.) The structure shall support safely a moving load uniformly distributed of 150 pounds per square foot, or a concentrated load of a 20-ton road roller, and a concentrated load of two 100-ton cars each on two trucks spaced 22 feet on centers, and at high speed, on each track.

ELECTRIC RAILWAY

(Does not apply unless numbered.) The structure shall support safely a concentrated load of two 100-ton cars each on two trucks spaced 22 feet on centers, and at high speed, on each track.

STEAM RAILWAY

(Does not apply unless numbered.) The structure shall support safely a concentrated load as defined in Cooper's E 50 specification, at high speed on each track.

HOME LABOR

4. In the employment of labor on ... ence shall be given to residents of the county.

CLOSING THOROUGHFARES

(Does not apply unless numbered.) The Owner will permit the closing of the location against all traffic until completed.

RIGHT-OF-WAY

(Does not apply unless numbered.) The Contractor shall provide a private right-of-way for traffic.

TEMPORARY BRIDGE

(Does not apply unless numbered.) The Contractor shall provide a private right-of-way for traffic and shall build and maintain a temporary bridge sufficient for traffic.

LINES AND GRADES

6. The Owner or his Engineer will set stakes for lines and grades for the proposed structure.

BRIDGE SITE

(Does not apply unless numbered.) The Contractor shall prepare the site for the new bridge. Any obstructing structure shall be removed and delivered without damage to the Owner within 500 feet of the site.

REMOVAL OF SUPERSTRUCTURE

(Does not apply unless numbered.) The Contractor shall deliver the old bridge without damage to the Owner, within 500 feet of the site, but may retain the lumber of the floor and stone of the abutments and piers as his property.

OLD BRIDGE

(Does not apply unless numbered.) The Contractor shall remove the old bridge which shall become his property.

PILING

8. Foundation piles must be of live, sound timber, exceeding six inches diameter at small end and not exceeding fifteen inches butt diameter, driven to penetration of ¼ inch for 20,000 f. p. Piling will be paid for per lineal foot of pile under the hammer.

EXCAVATION

9. The abutments or piers shall be placed with reference to bed of stream on foundations as indicated on the drawings, except that excavations need not be carried more than six inches into solid rock. The flood-proofing pavement, if shown on the drawings, shall be placed at the bed of the stream, but must be six inches below the grade of the stream as fixed by previous survey. If the structure does not then conform to the proposed grade of the road, the rise of the arch shall be increased or decreased to conform. When rock or hard-pan foundations occur in such form that they may be made to perform the functions of the flood-proofing pavement, the pavement and ties may be omitted by the Contractor. The upper surface of abutments shall be inclined or stepped to form a skew-back.

ADDITIONAL EXCAVATION

(Does not apply unless numbered.) Excavation and concrete additional to that shown on the plans if no base line is indicated, or below the base line in case such base line is shown on the plans and marked "Base Line," will be paid for per cubic yard of concrete only.

EXTRA DEPTH OF FOUNDATION

(Does not apply unless numbered.) In case satisfactory foundation is not found at the depth shown on the plan, the Contractor may continue the excavation until a foundation is obtained satisfactory to both parties, and shall build the bridge upon this foundation, and all labor and material requisite and necessary for this extra excavation and foundation below depth shown on the plan, shall be paid for at cost plus 10 per cent.

SHEET PILING

11. Foundations subject to scour shall be protected by sheet piling driven to refusal.

CONCRETE UNDER WATER

12. Concrete may be deposited under water provided a closed chute or tremie is employed and the proportions increasd to one of cement, to two of sand and four of stone.

CONCRETE

13. Concrete shall be composed of Portland cement, sand and broken stone or gravel.

CEMENT

14. Cement shall be Portland cement of good quality. Each package shall bear the name of the manufacturer and the brand. It shall fulfill the standard requirements prescribed by the American Society for Testing Materials, dated Sept. 1, 1916, for Portland Cement.

STONE

15. Stone shall be tough, hard and in graded sizes of ¼ to 2½ inches. For reinforced columns and beams, stone shall not exceed one inch in diameter.

GRAVEL

16. Gravel shall be a good quality of concrete gravel, free from earth or other fine material except sand, and shall not exceed three inches in diameter. If found in approximately correct proportions as specified for sand and stone, it may be used as found.

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SAND

17. Sand shall be clean and sharp, passing a ¼-inch sieve and not containing more than 5 per cent of clay, loam or other foreign matter. Clean crusher screenings may be used as a substitute for sand.

CENTERS AND FORMS

18. Centers and forms must be of sufficient strength to support the concrete rigidly until firmly set. Forms for all exposed surfaces shall be dressed and smooth. The lagging shall be made non-absorbent by saturation with water, or by filling with sludge or parraffin. At ten foot intervals, measuring from the springing ½ inch V. strips shall be nailed to the lagging to provide drip grooves in the under surface of the arch, across the construction joints. If not otherwise indicated the inner curve of the arch shall be a mean between a semi-ellipse and a circular segment of the same rise and span.

REINFORCING

19. Reinforcing members shall consist of soft or medium steel or iron, having an ultimate tensile strength of 55,000 to 75,000 pounds per square inch, and an elastic limit exceeding one-half the ultimate strength. The Contractor shall bend the reinforcing steel to conform to the plans. The reinforcement shall be placed as shown with connections between arch rods and abutment ties by means of open hooks or by wiring. Junctions in arch rods may be welded with secure scarf welds or else lapped forty diameters, but junctions in abutment ties must be welded or looped to develop full strength without adhesion of concrete. The ⅛x1-inch steel straps indicated on the drawing shall pass under each arch rod and be bent up into the concrete between arch rods to a heighth of at least one half the thickness of the arch ring. Steel not otherwise indicated shall be round rods of ¾-inch diameter. Arch rods shall cross the arch ring at one-third, one-half and two-thirds the distance from crown to springings. Arch rods lapped on abutment or pier anchors, shall extend to skewback, and the anchor rod shall extend to the first bend of the arch rod across the arch ring. Reinforcing members located near any surface shall have an embedment of approximately one inch from that surface. The coping course of the spandrels must contain sufficient reinforcement to provide for any possible tension in the arch extrados adjacent the crown.

MIXING CONCRETE

20. Concrete shall be mixed to a uniform consistency and color and sufficiently wet to permit of satisfactory spading.

PROPORTIONS

21. Concrete shall be mixed in the following proportions, measured by volume, loose: For arch rings, colnmns, girders, and when deposited under water, one of cement to two of sand, to four of stone, or the equivalent one of cement to five of sand and gravel combined. For abutments, piers, walls, pavements, aprons, etc., one of cement to three of sand to five of stone, or the equivalent one of cement to seven of sand and gravel combined.

EMBEDDING BOULDERS

22. Boulders or quarry stone may he embedded in the abutments, piers and footings if each stone is completely surrounded by at least two inches of concrete.

DIVISIONS

23. Divisions of arch ring are to be made parallel to the arch face so that the arch shall consist of longitudinal monolithic rings. Divisions of girders or beams shall be made transversely at the middle. Divisions of outside spandrel walls may be made above the springings only. The face of the arch ring must be concreted monolithically with the spandrel wall with no joint between.

EXPANSION JOINTS

24. Expansion joints must be provided at all points where temperature changes would otherwise cause unsightly cracks. In continuous spandrels expansion joints must be provided over the springings of the arches. Railings must be provided with joints at intervals of not more than twenty feet.

STOPPING WORK

25. In case rain or other unavoidable cause compels the stopping of the concreting in an unfinished section, a joint shall be made substantially normal to the member.

WEEP DRAINS

26. All enclosures from which water cannot escape save through the concrete shall be provided with suitable drains with inlet protected by large stones covered with gravel and extending in as nearly a straight line as practicable to discharge as near the water line as feasible.

ALIGNING COPINGS

27. Copings shall be built with extreme care to show true lines and camber. The forms for copings shall be aligned after the supporting wall is concreted, and the coping itself shall be subsequently added.

REMOVAL OF FORMS

28. Forms which do not support loads may be removed as soon as the concrete has taken its final set. Lagging should be removed from spandrels, copings and railings as early as practicable.

SPADE FINISH

29. All surfaces shall have a finish produced by spading the concrete next the lagging to flush the cement to the surface.

SURFACE WASH

(Does not apply unless numbered.) The surface must be washed with clean water, but in no case will a cement wash be permitted.

BRUSHED SURFACE

(Does not apply unless numbered.) Immediately after removal of lagging the film of surface cement shall be brushed out of all exposed surfaces, except overhead surfaces, unless otherwise indicated, with stiff bristle or wire brushes and clean water. No cement wash will be permitted.

POLISHED AND HAMMERED SURFACE

(Does not apply unless numbered.) Unless otherwise indicated all exposed surfaces below the coping, except overhead surfaces and spandrel faces, shall be polished with carborundum brick until the irregularities are removed. No cement wash will be permitted. Spandrel faces shall be dressed with sharp bush-hammers and subsequently washed with clean water.

COPING AND RAILING FINISH

31. The finish of all parts above the lower line of the copings will preferably be finer and more decorative than on the rest of the work, and great care should be taken to secure smooth surfaces. After early removal of the forms the surface will be brushed with clean water to remove the cement film.

BACK-FILLING

32. The Owner shall require that the structure be filled gradually and uniformly so that no eccentric application of loading will result. Filling against wings and spandrels must be placed with care and properly compacted. Filling must be permitted to flow around spandrel and wing ends. Retaining the fill with log or other barricades will not be permitted unless shown on the plans. Filling with frozen material will not be permitted. The Owner will notify the bridge Contractor when the filling is to be made.

FILLING AND APPROACHES

(Does not apply unless numbered.) Filling on the bridge to sub-grade twelve inches below the top of felloe guard and for approaches to a grade of.....per cent down from the bridge sub-grade to meet the road surface shall be made by the Contractor. Side-slopes shall be one and one-half horizontal to one vertical. A.....

.....

pavement, conforming to the standard specifications of the municipality for such pavements, shall be provided by the Contractor over the bridge and approaches of this contract and joined neatly to the old pavement.

FELLOE GUARDS

34. The felloe guards shall be true to line and grade, parallel to the coping and neatly rounded, and the upper one foot of guard and wall shall have the same surface finish as the outer coping face.

WALKS AND CURBS

(Does not apply unless numbered.) Cement walks and curbs conforming to the standard specifications of the municipality for such improvements shall be provided by the Contractor over the bridge and approaches of this contract and joined neatly to the old walks and curbs.

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OPENING TO TRAFFIC

36. The Contractor shall open the structure to traffic at such time as he may determine.

STRIKING CENTERS

37. The Contractor shall strike centers at such time as he may determine, and preferably after the fill has been substantially completed.

RAILINGS

38. The railings shall be added after centers are struck except on spans of less than thirty feet, unless the railing is provided with suitable joints to prevent cracking when centers are removed.

LAMP POSTS

(Does not apply unless numbered.) Concrete lamp posts shall be provided by the Contractor: ..... main lights supporting five globes each and ..... secondary lights supporting one globe each, with all fittings complete and connections leading through conduits, requiring only attachment to the mains or cables to become operative. Unless otherwise specified lamp posts shall be of fluted column design on square base, with capital, but with no pedestal, and with bronze fittings, and supported on railings or curbs, with lights at least nine feet above the roadway. Their finish shall harmonize with that of the railings.

FINAL CLEARING

40. The Contractor shall remove all false-work and all surplus materials from the bridge site.

ERECTION

41. All materials, tools, appliances, machinery and suitable labor necessary for the erection of this structure according to the plans and specifications shall be provided by the Contractor.

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PAYMENTS

42. Payments shall be made to the Contractor on monthly estimates filed for work done and materials delivered at the bridge site, which estimates shall become due and payable in the month following, except that ten per cent may be reserved by the Owner until the bridge is completed, when the balance remaining unpaid on said bridge shall become due and payable. See Contract

TIME OF COMPLETION

43. Each bidder shall name in his bid a certain definite number of working days in which he will agree to complete the work as outlined.

UNAVOIDABLE DELAYS

44. Should the weather or other conditions be such as to prevent the prosecution of the work to completion in the time named, or should such work be delayed by strike, war, order of court, or delay in transporting material, or should the commencement or prosecution of the work be delayed by the Owner, or by other causes beyond the control of the Contractor then an extension of time shall be allowed equivalent to such delay. In case of alterations by the Owner or his Engineer, an extension of time will be allowed.

LIQUIDATED DAMAGES

45. The Owner shall be entitled to liquidated damages from the Contractor of $.....for each and every day of delay in completion beyond the time named and extensions thereof, and the Contractor shall be entitled to a corresponding bonus for each and every day that the time named exceeds the time of actual completion.

INSPECTION

46. All materials shall be subject to inspection and approval according to these specifications.

GUARANTEE

47. The Contractor shall examine the plans and specifications and by submitting a bid on them shall signify his approval of them as correct in all details, and agrees to build in accordance with them, and to guarantee the proposed work for one year after completion against failure on account of any defects of design, workmanship and materials, said guarantee to be secured by the surety company bond accompanying the contract.

ALTERATIONS

48. Alterations in the plans and specifications may be made only on the order of the Owner or his Engineer approved by the Designing Engineer and the bondsman.

PATENTS

49. The Contractor shall protect the Owner against all claims for infringement of any patent on any device or process used in the structure.

ENGINEERING

50. The bridge construction required by these plans and specifications is of Luten Design and includes improvements, devices, features of design, methods of construction, inventions and copyrights owned by Daniel B. Luten, Designing and Consulting Engineer, of Indianapolis, Indiana. Each bidder upon these plans and specifications is directed to include in his bid, and to pay to said Daniel B. Luten at Indianapolis, Indiana, ten per cent of the contract price of everything included in these plans and specifications, promptly npon award of the contract; and by agreeing to build this work, the Contractor therefor agrees to pay said ten per cent of the owner's total cost to said Daniel B. Luten, at Indianapolis, Indiana, upon award of the contract. The said Daniel B. Lnten hereby agrees to protect the Contractor against suits for infringement because of any patents required by these plans and specifications.

ENGINEER'S ESTIMATE

The following quantities and costs are approximate only; their accuracy is not guaranteed. The Contractor must determine for himself the correct quantities and costs:

Right of Way				$
Temporary Bridge				
Removal of Old Bridge				
Excavation, Dry	Cu. Yds.		@	
Wet	Cu. Yds.		@	
Cofferdams, Lumber	Bd. Ft.		@	
Labor				
Sheeting Embankments, Lumber	Bd. Ft.		@	
Labor				
Shoring Buildings, Lumber	Bd. Ft.		@	
Labor				
Pumping				
Foundation Piling, Cost	Lin Ft.		@	
Driving	Lin. Ft.		@	
Falsework Piling, Cost	Lin. Ft.		@	
Driving	Lin. Ft.		@	
Steel	Lbs. f. o. b.		@	
Hauling				
Placing				
Lumber for Centers, Forms, Etc.	Bd. Ft.		@	
Lumber for Runways, platforms	Bd. Ft.		@	
Hardware, Nails, Etc.				
Erection Centers				
Erection Forms				
Concrete	Yds.	Labor Mixing		
		Labor Placing		
Cement	Bbls.		@	
Hauling Cement			@	
Sand Delivered	Yds.		@	
Gravel or Stone Delivered	Yds.		@	
Hauling Water				
Sprinkling Concrete				
Drains				
Waterproofing				
Expansion Joints				
Filling	Yds.		@	
Paving	Sq. Yds.		@	
Curbs	Lin. Ft.		@	
Sidewalks	Sq. Ft.		@	
Railing	Lin. Ft.		@	
Wiring and Conduits				
Lamps				
Removal of Centering and Forms				
Surface Finish	Sq. Ft.		@	
Superintendence				
Bond				
Employers' Liability Insurance				
Moving Plant				
Depreciation of Plant				
Contingent for Floods During Construction				
Royalty, Fees, Etc.				
Office Expenses				
		Total Cost		
		Add Profit		
		Estimated Cost to Owner		